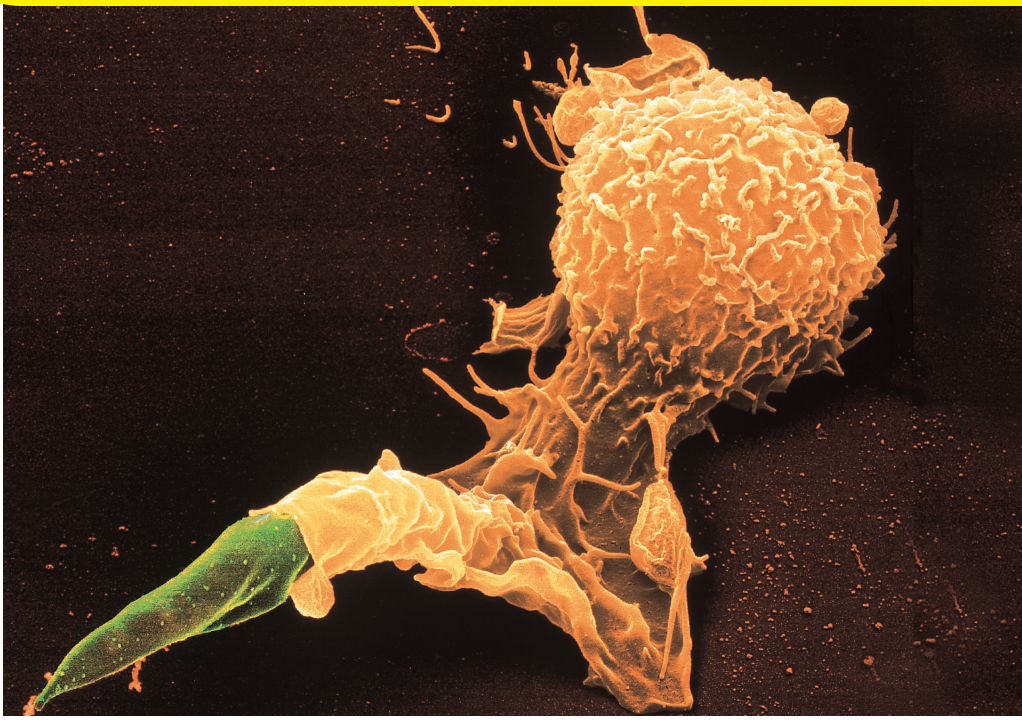
CHAPTER 12

Quantum Mechanics and the Atom

CHAPTER CONTENTS

PREREQUISITE CONCEPTS AND SKILLS

- J.J. Thomson's discovery of the electron
- Rutherford's scattering experiment



In the photograph above, a white blood cell is engulfing and destroying a parasite. This process, called "phagocytosis," is one way in which your immune system protects you from disease. The image of the white blood cell was formed not by light waves, but by electrons. In previous courses, you learned in detail how light waves form images. You discovered that the wave properties of light made image formation possible. It would seem logical then, that in order for electrons to form images, they must behave like waves.

The idea that electrons, and all forms of matter, have wavelike properties was one of the concepts that shook the world of physics in the early 1900s. This discovery, along with the observation that light behaves like particles, helped form the basis of quantum theory — a theory that has permanently changed scientists' perception of the physical world. The early observations and concepts seemed so theoretical and distant from the everyday world that it was difficult to see any potential impact on the daily lives of non-scientists. However, out of quantum theory grew such technologies as electron microscopes, lasers, semiconductor electronics, light meters, and many other practical tools. In this chapter, you will follow, step by step, how and why quantum theory developed and how it influenced scientists' concept of the atom.